Coalbed Methane Development Overview

NPS Western Energy Summit
January 21–23, 2003

National Park Service
U.S. Department of the Interior

Geologic Resources Divison
www2.nature.nps.gov/grd

Introduction

Coalbed Methane (CBM) is methane gas derived from buried coal beds. It is nearly identical with natural gas (CH_4), and is transported and used as an energy source in natural gas applications. CBM contains minor quantities of other gases, largely depending upon the type of coal it resides in and the geographic location where it is found. Coal beds act as CBM reservoirs, and hold and release the CBM based on the coal porosity.

Locations

The largest known concentration (56%) of CBM in the US is in the Rocky Mountains of Wyoming, Utah, New Mexico, Colorado, and Montana. Large deposits of CBM are known and being developed in the Powder River Basin, San Juan Basin, Uinta Basin, Piceance Basin, and Raton Basin. The U. S. Geological Survey estimates than approximately 50 Tcf (trillion cubic feet) is extractable in these basins using current technology.

Coal beds that have been strip-mined near the ground surface have lost or "leaked" their coalbed methane over the period of the strip mine activity. Coal beds that have not been strip-mined, are too deep for strip-mining or too thinly spaced for surface or underground mining often have recoverable coalbed methane. The Powder River Basin is an excellent example of both 1) major quantities of coalbed methane recoverable from land proposed for strip mines in the future, and 2) lands with coal beds thinly present and too deep for economic coal extraction.

History

Underground coal mines have long been recognized as hazardous environments for miners and their equipment. Methane displaces oxygen within the tunnels and can lead to suffocation or explosions. Many miners and mining tunnels/equipment have been lost due to inadequate venting of the methane gas. Venting of coal mines releases the methane safely to the atmosphere, but does not allow the methane to be collected or used.

Mining engineers and scientists considered the presence and possible productive use of the methane from coal beds in the mid 1900s, but early attempts at recovery met with only marginal and costly success. Not until the open hole well method of extraction was discovered and perfected was coal bed methane seen as a real and recoverable energy source. Commercial production of CBM quickly followed by 1981.

There are no CBM wells developed within NPS units, and no known plans to establish any. However, throughout the Rocky Mountain states and where significant coal beds exist, there is potential for CBM development. Private and public lands close to many of the western NPS units contain recoverable CBM so this development may come closer to these units in the near future.

Extraction

To produce methane from coal beds, the water permeating the coal bed must be drawn off first, lowering the pressure so methane can flow out of the coal and into the well bore. Throughout the 5-15 year life of a coalbed methane well, the gas derived increases and levels off, while the water quantities extracted usually decline and level off. The coalbed methane production life of the well depends upon the gas richness within the coal, coal porosity, drainage by other wells, depth of the well, and economics of the pumping and transportation to use areas.

In addition to the shorter production life of the CBM wells as compared to natural gas wells, as mentioned above, CBM wells require the removal of water from the coal bed and its subsequent disposal. Some coalbed methane fields produce clean, potable water. However, saline or other contaminates may be contained in the produced water that may adversely impact ranchers, riparian areas, and various wildlife species connected to the local habitat. During the life of these wells, livestock watering and formation of aquatic habitats to waterfowl may be benefits of the wells, when water quality is good. However ranchers' access across some previously dry washes can be denied, increased streamflow leads to erosion and vegetation changes and wildlife may become dependent on a temporary water source. Water storage ponds constructed to hold and evaporate extracted water both on and off streams may cause downstream erosion or flood damage if breached during wet seasons. Local and possibly regionally lowering of water tables is occurring with associated impacts to wells and springs.

Most of the other aspects of the development and operation of the CBM gas wells are similar to natural gas and oil wells throughout the western U.S.

Use

Use of CBM has grown more than 65% since 1994, and represents approximately 7% of the total natural gas usage in the U.S. Natural gas usage in the U.S. represents 24% of the country's energy needs, and 16% of electricity production. CBM joins natural gas as the fastest growing source of fuel for clean burning power plants. The U.S. Dept. of Energy (USDOE) estimates large increases in the uses of natural gas into the future. The current Administration's national energy plan includes CBM as an energy source that should be developed expeditiously with natural gas.

Impacts

The primary impacts of the development, extraction, and transportation of the CBM occur directly on the lands drilled, some downstream waters, and linearly along pipeline routes to major gas lines or its ultimate use. Ground disturbance for roads, drilling pads, pipelines and utilities occurs initially. Water discharges, equipment noise, compressor exhaust, dust development and wildlife habitat changes follow. And, longer term water table issues, irrigation water changes, and non native plant infestations follow too. But, whether on public or private lands, CBM has not traditionally been seen as directly affecting NPS units, since no direct development currently occurs on NPS lands.

The primary impact potential for lands outside of the CBM developed areas is air quality changes leading to visibility decreases. CBM developments have great potential to produce dust and fine particulate matter (PM 2.5 and PM 10) from roads and diesel exhaust. Diesel compressors used to pressurize and move the gas in the pipelines produce large quantities of nitrogen oxides and soot/dust. These airborne contaminants move downwind to affect visibility. NPS, and other agency/Tribe Class I air units, are potentially the most impacted, but Class II areas (like many NPS units) are also impacted to a lesser degree.

Water discharges from CBM development could potentially affect NPS units downstream due to changes in water quality and quantity or altered flooding characteristics from CBM water holding ponds.

Another difficulty for NPS (as well as the CBM leasing public agencies) with CBM developments is the split estate conditions, where the CBM mineral rights are owned separately from the surface landowner. The surface landowner, mineral owner agency, and the well development leasee become three parties to coordinate discussions with on the CBM developments.

Conclusions

NPS managers, planners and scientists should focus on the following issues with Coal Bed Methane:

· CBM is an important source of energy, handled and used the same as natural gas fuel.

· CBM development is occurring quickly, with industry and administration support.

· There are numerous CBM developments within potential impact distance to NPS Units and impacts differ from traditional oil and natural gas developments.

· Permits and regulatory processes for CBM have been targeted for streamlining, thus notification and review processes will probably occur at a quicker pace.

· Disputes between public and private entities are common in CBM development, because split estates, leasing stipulation vagueness, changing mitigation efforts, and a large number of small development contractors abound in CBM developments.

· Public agencies involved in CBM are understaffed for the pace, quantity and complexity of the CBM development on public lands.

· Communication links and information sharing between NPS and neighboring public agencies, neighboring landowners, agency resource scientists/planners (BLM, USFS, USFWS), non-governmental organizations, and private developers are critical.

· Resource staff and information papers are available through agency science and planning staff.

References

Numerous agency web pages contain extensive information on CBM.

http://www.doi.gov/coalbed/

http://www.blm.gov/nhp/300/w0310/Links/oglinks.html

http://energy.cr.usgs.gov/oilgas/noga/index.htm

http://oaspub.epa.gov/webi/meta_first_new2.try_these_first

http://www.fs.fed.us/cgi-in/texis/searchallsites/search.allsites/?query=+coal+bed+methane&db=allsites&jump=0

Coalbed Methane Development in the Intermountain West, Natural Resources Law Center, Boulder Colorado 80309 nrlc@spot.colorado.edu

De Bruin, R.H. et al, Coalbed Methane in Wyoming, Wyoming State Geological Survey, Information Pamphlet 7, Laramie, 2000.